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Alcohol Consumption Patterns and Blood Pressure: A Study among Meiteis of Manipur, India

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ABSTRACT Alcohol dependence (AD), a common complex disorder, is associated with various types of complex diseases resulting millions of deaths each year of which hypertension is one reported to be associated with alcohol dependence. The present study aims to understand the role of alcohol consumption and vulnerability to hypertension among Meiteis of Manipur, India. A total of 472 individuals (control=317, AD cases=155) unrelated up to 1st cousin were screened for hypertension. All the AD cases met DSM-IV criteria for alcohol dependence. No significant difference is observed between AD cases and controls with respect to hypertension. However, hypertensive cases were relatively higher among occasional drinkers (ODs) and moderate drinkers (MDs) as compared to absolute non- drinkers (NDs). Both ODs and MDs posed more than one-fold increased risk for hypertension. The present study indicates negative impact of alcohol consumption on health and it triggers hypertension specifically when ODs and MDs are concerned.

INTRODUCTION

Alcohol dependence is one of the leading health risks and is likely to become world's third largest risk factor for disease and disability. Chronic alcohol consumption is associated with increased incidence of many diseases, including cerebral thrombosis, metabolic syndrome and cardiovascular disease (Clerc et al. 2010) resulting in millions of deaths each year (WHO 2011). Similarly, hypertension alone claimed about 7.5 million deaths in a year and also estimated that hypertensive individuals may go upto 1.56 billion globally by 2025 (WHO 2013). Both alcohol dependence and hypertension are multifactorial diseases and considered risk factor for many other chronic diseases (Ferreira et al. 2017). Moreover, they are also responsible for increasing global burden of non-communicable diseases (Roerecke et al. 2017).

Epidemiological studies also revealed that alcohol consumption shows reversible cause/effect on blood pressure (Xin et al. 2001) as well as one of the causing factors for hypertension. As a result, alcohol consumption has become a major focus of interest in recent decades as a modifiable risk factor for hypertension (HTN) besides other traditional risk factors such as obesity, physical inactivity, sodium intake, low potassium or calcium intake (Klatsky 2004). Consumption of alcohol is attributable to hypertension even at low frequency suggesting independent association of alcohol and HTN (Klatsky 2003a). Association of harmful alcohol consumption with increased blood pressure level is also supported by many other studies (Ferreira et al. 2017; Fisher et al. 2017; Roerecke et al. 2017). Attributable risk for hypertension by alcohol consumption is estimated to be approximately sixteen percent worldwide. In a recent systematic review increase in hazardous and harmful drinking is found to increase newly detected hypertension cases among European population (Rehm et al. 2017). Though, role for alcohol-related hypertension is not well defined and many other epidemiological studies have debated the relationship between alcohol intake and hypertension (Puddey and Beilin 2006; Kenigsberg 2011). This could be due to lack of proven causal mechanisms of alcohol and blood pressure interrelationship.

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Objective

The main objective of the present study is to understand the risk of alcohol consumption and susceptibility towards hypertension with special reference to different degrees of alcohol consumption among Meiteis of Manipur, India.

METHODOLOGY

Subjects

A case-control study was carried out among 472 Meitei males unrelated up to 1st cousin. Of them, 155 individuals (mean age=49.77±10.11) were AD cases who follow DSM-IV criteria for alcohol dependence. The recruited AD cases include from rehabilitation centres (14.19%) and from door to door household surveys (85.81%). A total of 317 healthy age and sex-matched control individuals (mean age=50.82±10.13) were recruited from the same ethnic group residing in the same geographical region. Individuals taking hypertensive drugs under the control group are excluded from the study. Different patterns of drinking were found among the control individuals included in the present study such as non drinkers (NDs=129), occasional drinkers (ODs=116) and moderate drinkers (MDs=72). The different phenotypes of alcohol drinking were classified on the basis of quantity of alcohol consumed. Individuals who drink alcohol on rare occasions (<2 drinks per day) are categorised as occasional drinkers (ODs) whereas moderate drinkers (MDs) are those who drink <3 drinks per day. However, individuals who consumed alcohol among control group (ODs and MDs) do not fulfil DSM-IV criteria for alcohol dependence. Subjects having psychological problems as well as with multidrug users are excluded from the present study. Prior written consent was obtained from all the subjects and present study was approved by Departmental Research Ethical Committee.

Physiometric Variables

Fasting (early morning before any physical activities), systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured for all participants using mercury sphygmomanometers and stethoscope. Subjects were made seated for at least 5 minutes before taking the measurements. Blood pressure measurement was taken by single individual expertise in the field. Normotensive was defined as SBP <120 mmHg and DBP <80 mmHg and pre-hypertension was defined SBP 120 to 139 mmHg and/or DBP 80 to 89 mmHg. Hypertensive individuals were identified as having SBP <140 mmHg and/or DBP >90 mmHg or taking medication for hypertension. Moreover, Stage I and Stage II hypertension (according to JNC 7), were assessed among the studied population (Lenfant et al. 2003).

Statistical Analysis

Frequency distribution of different categories of hypertension was assessed among the studied population as well as comparison was made between NDs and ODs, NDs and MDs, NDs and AD cases using χ^2-test. Association of drinking status with different categories of hypertension was evaluated by Pearson's χ^2-test followed by odds ratio (OR) at ninety-five percent confidential interval (CI), using the freely available 2×2 contingency table (http://vassarstats.net/odds2x2.html). Statistical significance was considered at five percent level.

RESULTS

In the present study, hypertensive cases were found to be more frequent among controls (49.84%) as compared to AD cases (41.29%), though, the difference was not found to be statistically significant (p=0.08). Presence of such high frequencies of hypertensive cases could be due to the inclusion of ODs and MDs among the control group. Therefore, individuals with hypertension were assessed again in various subgroups of controls and AD cases to avoid the biasness due to the inclusion of NDs, ODs and MDs in control group. The result shows gradual increase of hypertensive individuals from NDs to ODs and MDs. Hypertensive cases is significantly higher among ODs (p=0.013) and borderline significance for MDs (p=0.074) as compared to absolute NDs. Even odds ratio showed one fold significant increased risk for hypertension among ODs (OR=1.89, CI 1.14-3.15, p=0.013) and borderline significant for MDs (OR=1.69, CI 0.95-3.03, p=0.07) (Table 1). The observed significant increase risk for hypertension among ODs and MDs could be due to the effect of alcohol consumption.

Table 1: Frequency distribution of normal and hypertensive individuals among sub-groups of controls (NDs, ODs, and MDs) and AD cases

Alcohol drinking patterns	*Normal BP(n, %)*	*Hypertension(n, %)*	*OR (95% CI)*	*p- value*
NDs (n,129)	76 (58.91)	53 (41.09)	Reference	-
ODs (n,116)	50 (43.10)	66 (56.90)	1.89 (1.14-3.15)	0.013
MDs (n,72)	33 (45.83)	39 (54.17)	1.69 (0.95-3.03)	0.074
AD cases (n,155)	91 (58.71)	64 (41.29)	1.01 (0.63-1.62)	1.000
Combined control (n, 317)	159 (50.16)	158 (49.84)	Reference	-
AD cases (n, 155)	91 (58.71)	64 (41.29)	0.71 (0.48-1.04)	0.099

In order to understand the relationship of aging and hypertension, studied population was categorized into different age groups and comparison was made between normotensive and hypertensive individuals in both controls and AD cases. Prevalence of hypertensive cases particularly among the younger age group of AD cases is higher than controls. It may be due to the ill effects of alcohol consumption. On the other hand, prevalence of hypertension increases with increase in age in both AD cases and controls. The highest frequency is observed among the age group 45-54 years in both AD cases (37.50%) and controls (31.39%). Though, the frequency of hypertension goes on decrease from this age group. This might possibly be due to constitution of small sample size in the studied population particularly those who are above 55 years of age. However, no significant difference was observed for age wise distribution of hypertension between AD cases and controls (p=0.512) (Table 2).

Table 2: Distribution of hypertensive cases among controls and AD cases with respect to different age groups

Age (years)	*Hypertension (n, %)*		χ^2 *(p-value)*
	Control (n=158)	*AD Cases (n=64)*	
25-34	0	1 (1.56)	
35-44	38 (24.05)	18 (28.12)	
45-54	59 (37.34)	24 (37.5)	3.28 (0.512)
55-60	43 (27.22)	14 (21.88)	
>65	18 (11.39)	7 (10.94)	

Further, to understand the effects of alcohol consumption on different patterns of hypertension such as pre-hypertension, Stage I and Stage II hypertension, comparison was made between NDs and ODs, NDs and MDs, NDs and AD cases. Normal blood pressure was found to be least among ODs (1.72%) and highest was observed among AD cases (12.9%). Whereas, distribution/prevalence of pre-hypertensive cases were found to be more frequent among NDs (55.04%). In other words, decreasing trends of individuals with pre hypertension was observed from NDs to ODs to MDs and slightly increasing among AD cases. Stage I hypertension was found to be highest among ODs (34.48%) followed by MDs (29.17%), NDs (28.68%), and slightly lower among AD individuals (25.16%). However, difference was found to be statistically significant between AD cases and NDs (χ^2=6.37, p=0.012). Individuals with stage II hypertension showed an increasing trend from NDs to ODs to MDs and slightly decreased among AD cases. Though, no statistical significant difference was observed (Table 3). Such increase in stage II hypertension from NDs to ODs to MDs may be the outcome of different degrees of alcohol consumption. The present finding reveals that increase in alcohol intake cause harmful effect on body by elevating blood pressure level.

Odds ratios were calculated for ODs, MDs and AD cases taking NDs as reference group to understand the risk for different stages of hypertension. Among the considered categories, ODs showed more than one fold increased risk in both prehypertension (OR=1.69, CI 0.31-9.07) and Stage I hypertension (OR=2.70, CI 0.49-14.79), though the risk was not found to be statistically significant (p>0.05). Both ODs and MDs posed 4.06 and 1.72 fold increased risk for Stage II hypertension respectively, though, the risk was not found to be statistically significant in both ODs (OR=4.06, CI 0.70-23.47) and MDs (OR=1.72 CI 0.40-7.43). The result of odds ratio suggested that alcohol consumption is one of the potential risk factors for hypertension even alcohol is consumed occasionally or moderately.

DISCUSSION

Hypertension is one of the most important risk factors that can lead to adverse health conse-

Table 3: Distribution of different categories of blood pressure among sub-groups of control (ND, OD and MD) and AD cases

Alcohol drinking patters	*Categories of blood pressure*				÷2 (p-value)		
	Normal (n, %)	*Pre-hypertension (n, %)*	*Stage I (n, %)*	*Stage II (n, %)*	p^1	p^2	p^3
NDs (n, 129)	5 (3.88)	71 (55.04)	37 (28.68)	16 (12.4)	Reference	-	-
ODs (n, 116)	2 (1.72)	48 (41.38)	40 (34.48)	26 (22.41)	0.382 (0.536)	1.40 (0.236)	2.72 (0.099)
MDs (n, 72)	4 (5.56)	29 (40.28)	21 (29.17)	18 (25.0)	0.93 (0.334)	0.23 (0.634)	0.21 (0.650)
AD Cases (n, 155)	20 (12.9)	71 (45.81)	39 (25.16)	25 (16.13)	7.71 (0.005)	6.37 (0.012)	2.59 (0.107)
Combined Control (n, 317)	11 (3.47)	148 (46.69)	98 (30.91)	60 (18.93)	0.93E-02 (0.923)	0.10 (0.746)	0.78 (0.377)

p1= NDs vs ODs, MDs, AD Cases and Combined Control; wrt normal and pre-hypertension
p2 = NDs vs ODs, MDs, AD Cases and Combined Control; wrt normal and stage I
p3 = NDs vs ODs, MDs, AD Cases and Combined Control; wrt normal and stage II

quences if not diagnosed early and treated appropriately (Naing and Aung 2014). Association between chronic alcohol consumption and elevation of blood pressure has been shown in both genders, different ethnic groups, and across all adult age groups (Klatsky and Gunderson 2008). However, findings of the present study showed contrasting result from other association studies reporting positive association of chronic alcohol consumption with hypertension (MacMahon 1987; Russell et al.1999; Klatsky 2000; Kawano 2010; Son 2011). It could be due to the presence of low frequency of hypertensive individuals among AD cases. The observed low frequency of hypertension and higher frequency of normal blood pressure among AD cases could be attributed to inclusion of AD cases from de-addiction centre as their blood pressure is being controlled as they are restricted for alcohol use as well as they are under treatment for alcohol withdrawal and de-addiction. This is in agreement with studies reporting sharp decrease in blood pressure among chronic alcoholics on early alcohol withdrawal (Ceccanti et al. 2006). Findings of the present study is also supported by other studies that restriction on harmful alcohol use is reported to lower down the blood pressure levels (Roerecke et al. 2017; Rehm et al. 2017).

Age is considered as one of the important potential risk factor for hypertension. Literatures reveal that prevalence of hypertension increased with age (van Rossum et al. 2000). In the present studied population, prevalence of hypertension increases with advancing age and the highest peak of hypertension were observed in the age group 45-54 years. It is in accordance with previous reports suggesting that odds of hypertension among aged between 40-60 years had more than seven times than subjects below 25 years of age (Singh et al. 2017). Findings of the present study are consistent with that of other published reports among rural and urban population of India (Gupta et al. 1996; Yadav et al. 2008; Gupta and Guptha 2010; Singh et al. 2017).

Regarding protective effects of alcohol consumption against cardiovascular diseases, several studies revealed reduced risk of atherosclerotic vascular disease and hypertension among light to moderate drinkers (Corrao et al. 2000; Klatsky 2003b; Puddey and Beilin 2006). How-

ever, present study shows contradicting results against reduced risk of hypertension among occasional to moderate drinkers. Moreover, both ODs and MDs showed higher incidence of stage I and II hypertension than NDs and AD cases. It provides higher risk of cardiovascular diseases among ODs and MDs who do not fulfil DSM-IV criteria for alcohol dependence. Such high frequency of hypertensive cases among ODs and MDs might be attributed to abrupt changes in physiological pathways as a result of sudden alcohol intake. When individuals who are earlier non-drinkers start to consume alcohol, the physiological alterations are expected and these abrupt changes in physiological pathways might result in variable phenotypes of hypertension. The present studied population shows that it is more prone towards cardiovascular risks in the form of hypertension as evidence from present findings of high prevalence of pre-hypertensive cases among non-drinkers. It is further confirmed by significantly high prevalence of HTN among ODs and MDs when they start taking alcohol occasionally and moderately making them predispose to onset of hypertension. Moreover, the present study provides supportive evidence for the suggestion that alcohol has long-term effects on blood pressure and risk for hypertension (Russell et al. 1999; Roerecke et al. 2017; Rehm et al. 2017). The observed variation of blood pressure among different patterns of alcohol intake could be due to unmeasured other confounding risk factors like socio-economic, stress, dietary habits, lifestyles and individual genetic compositions. Significantly higher prevalence of prehypertension among NDs compared with other drinking patterns could possibly be due to above unmeasured risk factors. Though, it needs to be proved into as it hints towards potential risk for hypertension in near future among the studied population.

On the other hand, most of the ODs and MDs who were found to be hypertensive, during the measurement, were not aware about their hypertensive status. It could be one of the reasons responsible for rise in hypertension among the studied population where prevalence of alcohol consumption is very high. Such pattern of drinking (ODs and MDs) may further lead to adverse health consequences other than cardiovascular diseases including alcohol induced liver diseases, different types of cancers, domestic violence, and suicide (for review WHO 2014). Moreover, the cost of medical expenses on alcohol-related diseases has raised causing overburden among lower income families. As a result, hypertension raises a possibility of great potential public health importance and has also become an increasingly important contributor to the global health burden (Ezzati et al. 2002; Rehm et al. 2017). Therefore, it will affect in achieving the goal of WHO global action plan for prevention and control of non-communicable disease, if such regional problems continues and if it is not monitored in time.

CONCLUSION

In the present study, hypertension was found to be higher among combined controls (including NDs, ODs and MDs) as compared to the AD cases. Prevalence of pre-hypertension was highest among NDs indicating predisposition towards hypertension and cardiovascular related diseases in future life. Individuals with ODs and MDs considered as controls according to DSM-IV criterion are at higher risk for hypertension. From the available data, it could be suggested that alcohol intake has negative impact on health and trigger towards hypertension risk. Moreover, the presence of association of ODs and MDs with hypertension is a good indicator of the negative effect of alcohol consumption specifically in the form of hypertension. Therefore, the common belief of protective effects of alcohol drinking against cardiovascular outcomes need to be carefully re-monitored along with many other adverse health consequences from drinking particularly among populations having high background of cardiovascular risk profile.

RECOMMENDATIONS

The present studied population needs to take up some preventive measures on hypertension to lower down the high prevalence of pre-hypertension. They are also likely to have more adverse cardiovascular risks in their later life as the prevalence of alcohol drinkers is very high. Moreover, the perception of positive effects of alcohol consumption in one's health should be

very cautious as low level of alcohol consumption can also predispose to greater risk of adverse cardiovascular diseases. Individuals who consume alcohol occasionally or moderately should be conscious that they are also prone to hypertension and its associated complex diseases like alcohol dependent persons. Therefore, effects of alcohol drinking patterns on health outcomes need to be carefully considered to prevent from adverse health consequences.

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